

CLAIMS

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1. An electro-optical device, comprising:
a substrate;
a plurality of scanning lines;
a plurality of data lines;
a thin-film transistor and a pixel electrode disposed at intersections between each of the scanning lines and each of the data lines;
a light-shielding first conductive layer disposed between a semiconductor layer constituting a source region and a drain region of the thin-film transistor, and the pixel electrode, the first conductive layer being electrically connected to the semiconductor layer and electrically connected to the pixel electrode; and
a second conductive layer comprising the same film as that of the first conductive layer, at least partially overlapping the data lines in a plan view.
2. The electro-optical device according to claim 1, wherein the second conductive layer at least partially overlaps the pixel electrode in a plan view.
3. The electro-optical device according to one of claims 1 and 2, wherein the first conductive layer is electrically connected to the semiconductor layer through a first contact hole and is electrically connected to the pixel electrode through a second contact hole.

4. The electro-optical device according to any one of claims 1 to 3, wherein the data lines are electrically connected to the semiconductor layer through a third contact hole.

5. The electro-optical device according to any one of claims 1 to 4, wherein the data lines do not at least partially overlap the pixel electrode in a plan view.

6. The electro-optical device according to any one of claims 1 to 5, wherein the second conductive layer is electrically connected to a constant-potential line.

7. The electro-optical device according to any one of claims 1 to 6, further comprising a light-shielding film formed on a substrate side of at least a channel region of the semiconductor layer with an underlying insulating film therebetween.

8. The electro-optical device according to any one of claims 1 to 7, wherein the first conductive layer and the second conductive layer comprise a high-melting point metal.

9. The electro-optical device according to any one of claims 1 to 8, wherein the second conductive layer and the data lines are at least partially disposed opposite to each other with an interlayer insulating film therebetween.

10. The electro-optical device according to any one of claims 1 to 9, further comprising a storage capacitor connected to the pixel electrode.

11. The electro-optical device according to claim 10, wherein the first conductive layer and the second conductive layer are provided on the scanning lines and one electrode of the storage capacitor with an insulating film therebetween.

5 12. The electro-optical device according to claim 11, wherein a first storage capacitor electrode comprising a portion of the semiconductor layer and a second storage capacitor electrode as said one electrode of the storage capacitor are disposed opposite to each other with a first dielectric film therebetween, and the second storage capacitor electrode and a third storage capacitor electrode comprising a portion of the first conductive layer are disposed opposite to each other with a second dielectric film therebetween, to form the storage capacitor.

10 13. The electro-optical device according to any one of claims 10 to 12, wherein the second conductive layer is connected to the second storage capacitor electrode.

15 14. The electro-optical device according to claim 13, wherein the second conductive layer is electrically connected to the second storage capacitor electrode through a fourth contact hole, and the fourth contact hole is opened in the same step as that of opening the first contact hole.

20 15. The electro-optical device according to claim 12, wherein the second storage capacitor electrode extends to form a capacitor line.

25 16. The electro-optical device according to claim 13, wherein the second storage capacitor electrode is connected to the light-shielding film.

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17. The electro-optical device according to claim 16, wherein the light-shielding film also acts as the capacitor line, a planar shape of the second storage capacitor electrode on the substrate extends along a scanning line between adjacent data lines, and the second storage capacitor electrode is shaped like an island for each pixel electrode and is connected to the light-shielding film.

18. The electro-optical device according to claim 15, wherein the light-shielding film is electrically connected to the capacitor line through a fifth contact hole opened at a planar position different from that of the fourth contact hole.

19. The electro-optical device according to any one of claims 10 to 18, wherein the second conductive layer and the light-shielding film are electrically connected to each other through the second storage capacitor electrode, and the second conductive layer and the light-shielding film are connected to adjacent pixel electrodes.

20. The electro-optical device according to any one of claims 1 to 19, wherein the first conductive layer and the second conductive layer are provided below the data lines.

21. The electro-optical device according to any one of claims 1 to 20, wherein the second conductive layer is shaped like an island in a plan view and at least partially delimits a region along the data lines in a pixel-aperture region.

22. The electro-optical device according to any one of claims 1 to 10, wherein the first conductive layer and the second conductive layer are provided above the data lines.

5 23. The electro-optical device according to claim 22, wherein the second conductive layer is formed like a grid excluding a region in which the first conductive layer is present in a plan view and delimits regions along the data lines and the scanning lines in the pixel-aperture region.

10 24. The electro-optical device according to one of claims 22 and 23, wherein the semiconductor layer and the first conductive layer are connected to each other with an interconnecting conductive layer comprising the same film as that of the data lines therebetween.

15 25. The electro-optical device according to claim 24, further comprising a storage capacitor connected to the pixel electrode, wherein the data lines are sandwiched between one electrode of the storage capacitor and the second conductive layer with an interlayer insulating film therebetween.

20 26. A method for fabricating an electro-optical device comprising a substrate, a plurality of scanning lines, a plurality of data lines, a thin-film transistor connected to each of the scanning lines and each of the data lines, and a pixel electrode connected to the thin-film transistor, the method comprising the steps of:

25 forming a semiconductor layer for producing a source region, a channel region, and a drain region on the substrate;

forming an insulating thin film on the semiconductor layer;

5 forming the scanning lines and one electrode of a storage capacitor on the insulating thin film;

forming a first interlayer insulating film on the scanning lines and the one electrode;

making a first contact hole leading to the semiconductor layer in the insulating film and the first interlayer insulating film;

10 forming a light-shielding first conductive layer on the first interlayer insulating film so as to be electrically connected to the semiconductor layer through the first contact hole and forming a second conductive layer comprising the same film as that of the first conductive layer;

15 forming a second interlayer insulating film on the first conductive layer and the second conductive layer;

forming the data lines on the second interlayer insulating film;

forming a third interlayer insulating film on the data lines;

20 making a second contact hole leading to the first conductive layer in the second interlayer insulating film and the third interlayer insulating film; and

forming the pixel electrode so as to be electrically connected to the first conductive layer through the second contact hole,

25 wherein the second conductive layer is formed so as to at least partially overlap the data lines in a plan view.

27. The method for fabricating an electro-optical device according to claim 26, further comprising the step of:

making a third contact hole leading to the second interlayer insulating film
after the step of forming the second interlayer insulating film, wherein in the step of
forming the data lines, the data lines are formed so as to be electrically connected to the
semiconductor layer through the third contact hole, in the step of making the first contact
5 hole, a fourth contact hole leading to the one electrode of the storage capacitor is made in
the first interlayer insulating film simultaneously with the making of the first contact hole,
and in the step of forming the second conductive layer, the second conductive layer is
formed so as to be electrically connected to the one electrode of the storage capacitor
through the fourth contact hole.

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10 28. A method for fabricating an electro-optical device comprising a substrate, a plurality of scanning lines, a plurality of data lines, a thin-film transistor connected to each of the scanning lines and each of the data lines, and a pixel electrode connected to the thin-film transistor, the method comprising the steps of:

15 forming a semiconductor layer for producing a source region, a channel region, and a drain region on the substrate;

forming an insulating thin film on the semiconductor layer;

forming the scanning lines and one electrode of a storage capacitor on the insulating thin film;

20 forming a first interlayer insulating film on the scanning lines and the one electrode of the storage capacitor;

making a first contact hole leading to the semiconductor layer in the first interlayer insulating film;

25 forming the data lines on the first interlayer insulating film and simultaneously forming an interconnecting conductive layer comprising the same film as

that of the data lines so as to be electrically connected to the semiconductor layer through the first contact hole;

forming a second interlayer insulating film on the data lines and the interconnecting conductive layer;

5 making a second contact hole leading to the interconnecting conductive layer in the second interlayer insulating film;

forming a light-shielding first conductive film on the second interlayer insulating film so as to be electrically connected to the interconnecting conductive layer through the second contact hole, and simultaneously forming a second conductive layer comprising the same film as that of the first conductive layer so as to overlap the data lines in a plan view;

forming a third interlayer insulating film on the first conductive layer and the second conductive layer;

making a third contact hole leading to the first conductive layer in the third interlayer insulating film; and

forming the pixel electrode so as to be electrically connected to the first conductive layer through the third contact hole.

29. The method for fabricating an electro-optical device according to claim 28,
20 further comprising the step of:

making a fourth contact hole leading to the semiconductor layer in the first interlayer insulating film after the step of forming the first interlayer insulating film, wherein in the step of forming the data lines, the data lines are formed so as to be electrically connected to the semiconductor layer through the fourth contact hole, in the step of making the second contact hole, a fifth contact hole leading to the one electrode of

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the storage capacitor is made in the first interlayer insulating film and in the second interlayer insulating film simultaneously with the making of the second contact hole, and in the step of forming the second conductive layer, the second conductive layer is formed so as to be electrically connected to said one-electrode of the storage capacitor through the fifth contact hole.

30. An electronic apparatus comprising the electro-optical device according to any one of claims 1 to 25.

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